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ABSTRACT

The Sherman-Kulhavy Laterality Assessment Inventory (LAI), an instrument for determining cerebral laterality, was administered to 1,000 undergraduates to determine the ability of the LAI to discriminate between right- and left-dominant groups. Each S was administered the LAI, a 45-item verbal report instrument which assesses both fine and gross motor activities of the hands, arms, legs, and feet. For each S, three scores were computed: a total right score (derived from summing the number of right always and right mostly responses), a total left score (from left always and left mostly responses), and a relative dominance score (a ratio calculated from the first two scores). Results indicated that the LAI is a reliable and consistently accurate means of assessing cerebral laterality and that the LAI has an extremely high degree of predictive accuracy. (Statistical tables and graphs concerning the reliability, validity, and factor structure of the instrument are provided.) (SB)

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Technical Report No. 4

THE ASSESSMENT OF CEREBRAL LATERALITY: THE SHERMAN-KULHAVY LATERALITY ASSESSMENT INVENTORY

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Abstract

Questionnaires previously used to assess cerebral laterality are deficient in several respects. Attempts are rarely made to describe the underlying structure of the laterality dimension. Also, the ability of a questionnaire to accurately distinguish and separate right- and left-dominant groups is seldom reported. This paper presents data collected with the Sherman-Kulhavy Laterality Assessment Inventory (LAI). The paper reports extensive psychometric data dealing with the ability of the LAI to identify and discriminate between right- and left-dominant groups, and includes data concerning the reliability, validity, and factor structure of the instrument.

The Assessment of Cerebral Laterality:
The Sherman-Kulhavy Laterality Assessment Inventory

In recent years there has been a revival of interest in the relations between cerebral laterality and the processing of stimulus information. For example, right- and left-handed persons have demonstrated differing degrees of facility with imaginal-spatial material (Levy, 1969; Sherman, Kulhavy & Burns, 1976; Sherman, 1976), differences in learning strategies and conceptual styles (Cohen, 1969; Karshen, 1975), and even different patterns of classroom seating preferences (Gur, Gur & Marshalek, 1975). Furthermore, insufficient lateralization of the cerebral hemispheres has long been proposed as an underlying cause of a variety of language disorders such as dyslexia (Orton, 1974), stuttering (Travis & Lindsley, 1933), and various apraxias (Geschwind, 1975). Before these differences in processing strategies can be thoroughly explored it is necessary to be able to accurately characterize and assess cerebral laterality. In the present paper a simple and efficient method for determining cerebral laterality is presented. A description of administration and scoring procedures, and data describing the utility of the instrument will be presented following a brief review of several common approaches to the assessment problem.

Traditionally, investigators have relied upon four general techniques for determining right- or left-sidedness. These different methods can be conveniently classified into (1) those which focus on morphological and morphofunctional characteristics, (2) batteries of manual tests of right-

and left-sidedness, (3) various special techniques, and (4) questionnaires about right- and left-sidedness. In each case response patterns are noted and inferences are then made as to the underlying functional organization of the cortical hemispheres.

The morphological appearance of the bones and muscular development have been frequently used as indicators of right- and left-sidedness. These characteristics may have some value in terms of their asymmetry, however, they are suspect, since the thickness of a limb depends more on the extent to which it has been used, than on its primary characteristics. Also, tests employing the dynamometer as an indication of right- or left-sidedness have been critisized as being tests of strength, whereas right- or left-sidedness depends mainly on potential skill (Burt, 1937). Recently, somewhat greater significance has been attributed to such neurological tests as extensibility and synkinesis, by Hecean and Ajuriaguerra (1964). Data describing these measures is scarce, however, and the validity of such methods is difficult to evaluate.

Another common laterality assessment technique involves having subjects perform various unimanual tasks which are generally of a semi-novel kind, with the right and left hands. Performances can be scored objectively, and are possible to assess quantitatively. Typically, an index such as (R-L)/(R+L) is computed, where R is the number of acts performed by the right hand, and L the number performed by the left hand. The distribution of indices which results when subjects are assessed on unfamiliar and unpracticed tasks does not, however, accurately reflect the full extent of the differences between right- and left-handed groups.

As Oldfield (1971) indicated, "... the right-left differences displayed by such methods are relatively small and certainly do not correspond with the gross disparity between the two hands which is manifest in well-established tasks" (p.97). As discussed below, a different distribution of indices results from various verbal inventories.

Several special testing techniques have provided useful information regarding cerebral laterality and the localization of various cognitive abilities. The test of Waada (1960), which involves anesthetizing an entire cerebral hemisphere, has proven to be a very effective menas for determining lateralization of language functions. However, injecting sodium Amytal into the carotid artery is a little used technique since it involves some risk and considerable expertise. Other methods used for determining cerebral dominance include electromyographic tests (Cernacek, 1961), the use of the phi phenomenon (Jasper & Raney, 1937), and the critical angle board (Clark, 1957). Although these tests have a great deal of theoretical importance, their complex nature prevents them from being widely used.

Probably the most practical and reliable method for assessing cerebral laterality involves the use of questionnaires about right- and left-sidedness. A primary advantage is the large amount of data which they supply for statistical research. Both the number and types of questions emplc/ed vary greatly. Typically, about 15 to 20 items are used, and some type of laterality or handedness index is derived (e.g., see Dusewicz & Kershner, 1969; Oldfield, 1971). Distributions of indices computed in this fashion usually form a nonsymmetrical U, which apparently

is a far more accurate reflection of the actual incidence of handedness or laterality in a normal population (Annett, 1964). Thus, of all measures used to assess right- or left-sidedness, questionnaires appear to be the most preferable in terms of administration, reliability of scoring, and the overall amount of information provided.

It is our belief, however, that the questionnaires commonly used reflect several inherent misconceptions regarding the actual nature of cerebral laterality and the localization of cerebral function. Attempts are rarely made to get at the underlying structure of the laterality dimension. Rather, investigators simply choose a sample of activities for assessment, and call the resulting measure a laterality or handedness quotient. Also, the laterality dimension is usually split into discrete right- and left- sections with little or no effort made to describe the instrument's ability to distinguish and separate these two groups accurately. This paper is an attempt to remedy some of the deficits in previous questionnaire research on laterality. Our results are based on data collected with the Sherman-Kulhavy Laterality Assessment Inventory (LAI). This instrument has been previously shown to have a high degree of predictive validity (Sherman, Kulhavy & Burns, 1976; Sherman, Kulhavy & Bretzing, 1976). The LAI views laterality as a continuous variable, extending from pure right- to pure left-handedness. The remainder of the paper presents psychometric data dealing with the ability of the LAI to identify, and discriminate between, various intervals on the laterality continuum. Finally, our discussion will include extensive information concerning the reliability, validity, and factor structure of the instrument.

Method

Subjects

The LAI was initially administered to 1000 undergraduates at Arizona State University either individually or in groups ranging from 40-100. The sample consisted of 367 males and 633 females.

Administration and Scoring

The LAI is a 45-item verbal report instrument which assesses both fine and gross motor activities of the hands, arms, legs and feet[1] (see Appendix A). For each item on the questionnaire a subject indicates whether (s)he uses the right always, right mostly, both right and left equally often, left mostly, or left always. For each respondent, three scores are computed. First, a total right score is derived by summing the number of right always and right mostly responses. Likewise, the total number of left always and left mostly responses comprises the left score. The ratio of these two scores provides the investigator with an estimate of the relative dominance of one side over the other. A composite laterality coefficient is obtained by weighting the various response categories in the following manner: right always = 1; right mostly = 2; both equally often = 3; left mostly = 4; and left always = 5. By multiplying the total number of responses for a particular category by the appropriate weights, and summing these components, a composite laterality coefficient is formed. The range of possible laterality coefficients thus extends from 45 (all right always responses) to 225 (all left always responses). By calculating a composite score in this manner, one is able to place an individual on a continuum extending from "pure" right to "pure" left dominance.

Results

Distribution of Composite Laterality Coefficients

Of the 1000 persons completing the LAI, 106 failed to report names and sex on the Inventory. Complete data on these variables was therefore obtained for 894 cases. For these respondents, the proportion of right- and left-handers did not differ significantly across sexes, $\chi^2(2)=2.13$ $p>.1$. The distribution of laterality coefficients was therefore collapsed across the sex variable.

Figure 1 presents the entire distribution of laterality coefficients. The endpoints of the continuum are 45 indicating "pure" right dominance, and 225 reflecting "pure" left dominance. Eight hundred forty-five

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Insert Figure 1 about here

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persons identified themselves as right-handers, and 155 as mixed or left-handers. As Figure 1 illustrates, the distribution of laterality coefficients accurately reflects these trends. Approximately 85% of all respondents obtained scores between 45 and 110 clearly indicating right-dominance. A small hump in the curve appears between 110 and 150, reflecting the 5% of the sample who were evidently somewhat ambidextrous. The remaining segment of the distribution, accounting for about 10% of the sample, were identified as left-dominant. This last segment extends from approximately 150 to 225.

Due to the large degree of skewness in the overall distribution, several of the analyses to be reported in subsequent sections, were

performed on an additional sub-sample of 155 left- and mixed-handers, and 155 randomly selected right-handers. The coefficients for this sub-sample of 310 right- and left(mixed)-dominant persons was far more symmetrical. Figure 2 presents the distribution of composite laterality coefficients for these 310 cases.

Insert Figure 2 about here

Item Analyses

In order to determine the relative importance of the individual items in relation to the total LAI, an item analysis was performed. The responses of all 1000 cases, and the sub-sample of 310 were separately analyzed. The means, standard deviations, and indices of discrimination for all 45 items appear in Table 1. The first three columns of Table 1 contain the

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Insert Table 1 about here

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item statistics generated from the total sample. These same statistics, generated from the sub-sample of 310 cases, appear in the last three columns of the table. Inspection of Table 1 reveals that almost all items are contributing to the overall discriminability of the composite test. Of all the items, only numbers 13 and 38 appear to be particularly poor discriminators. These two items deal with carrying books or bookbags, and holding golf clubs. Apparently both right- and left- groups use either hand to carry books, which would account for the lack of differentiation. The poor discriminability of item 38 is probably due to general unfamiliarity with proper golf techniques.

Since it is the authors' belief that laterality is best conceptualized as a tri-modal continuum, no effort was made to derive precise cut-offs between the subgroups. In this regard, an individual is not labelled specifically as a right-, mixed-, or left-hander. Rather, each person is viewed as simply falling somewhere along this continuum, which ranges from the two possible extreme forms of cortical organization.

Reliability

Cronbach's coefficient alpha was computed for the composite LAI, on the total sample of screened subjects. The resultant coefficient was .97. Also, the split-half reliability for the test was found to be .98. Thus, this instrument appears to be a highly reliable and internally consistent measure.

Factor Analyses

In order to identify the salient dimensions underlying the LAI, the data was factor analyzed. As a first step in the analysis, responses to the 45 items were intercorrelated using Pearson product-moment correlation coefficients.[2] The resulting correlation matrix was not invertible, thus maximal off-diagonal elements of the correlation matrix were used as communality estimates. The initial solution was iterated. Six factors with eigenvalues greater than 1.00 were isolated, accounting for 68.5% of the total variance. The rotation procedure was Kaiser's Varimax with normalization. Table 2 presents the rotated factor matrix.

Insert Table 2 about here

The resulting structure revealed the presence of a general laterality factor accounting for 81.8% of the total variance. The five additional factors apparently tap rotational or turning abilities, left-right coordinate activities, arm-swinging movements, clothing activities, and carrying motions, respectively.

Since the skewness of the overall distribution may have biased the initial solution, a subsequent analysis was performed. The data from the 155 mixed- and left-handed persons, and 155 randomly selected right-handed persons was independently analyzed. This data was factor analyzed in exactly the same manner as the initial solution. The analysis yielded a pattern of results identical to that of the entire sample. As in the first analysis, six factors with eigenvalues greater than 1.00 were isolated, this time accounting for 74.3% of the total variance. Kaiser's Varimax was the rotation procedure employed. The resulting structure revealed an analogous factor pattern. Again, a general laterality factor emerged, accounting for 80.9% of the total variance. The five additional factors loaded on approximately the same items as in the first solution. Thus, the underlying structure of the LAI appears to be quite stable regardless of the size and nature of the distribution of scores analyzed.

Discriminant Analyses

This phase of the analysis focuses on the ability of the LAI to discriminate accurately between groups of right- and left(mixed)-handed persons. Data is reported from discriminant analyses on the total 1000 subjects, and also for 310 subjects consisting of equal numbers of right- and left-dominant subjects.

In all cases, the 45 independent variables were entered into the analysis concurrently. Since in this analysis only two groups were defined, one discriminant function resulted. The group centroids in reduced space were .12886 and - .70248 for the right- and left(mixed)-handed groups, respectively. The eigenvalue associated with the function was 42.18477, indicating that this function was highly significant, $\chi^2(45) = 3673.233$, $p<.000$. The canonical correlation between this discriminant function and the "group variable" was .988, indicating once again, that this function discriminates very well between the two groups. The canonical correlation squared may also be interpreted as the proportion of variance in the discriminant function explained by the groups. In this case the group differences accounted for approximately 98% of the variance in the discriminant function. Table 3 presents the standardized discriminant coefficients associated with this function. Since most items loaded on this function,

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Insert Table 3 about here

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it may be interpreted as a general laterality separation, corresponding to the first factor originally isolated.

The above data were generated from the total 1000 sample cases. Due to the nature of the overall distribution discussed previously, it was decided to replicate these analyses on the sample consisting of equal numbers of right- and left(mixed)-handed subjects. For this analysis one function was also produced. The group centroids were -.30081 and +.30081

for the right- and left(mixed)-dominant groups, respectively. The eigenvalue associated with this function was 59.57633, which was highly significant, $\chi^2(45) = 1171.665$, $p<.000$. The canonical correlation for for this function was .992, indicating that once again about 98% of the variance in the function was attributable to the group differences. The pattern of standardized discriminant function coefficients was essentially the same as that for the total sample, and are therefore not reported. Figure 3 presents the distribution of discriminant scores for the 310 persons in this analysis. If one compares this distribution to the original

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Insert Figure 3 about here

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distribution of composite laterality coefficients (Figure 2) the power of the LAI to separate the two groups becomes immediately apparent.

Cross Validation

Data from a separate group of 200 undergraduates was used to assess the overall predictability of the discriminant function. Discriminant scores were computed for these individuals, based on the weights derived from the analysis of the original sample. Predictions of group membership based on this discriminant function were found to be 99% accurated, with only 2 cases classified incorrectly. Thus, this function appears to distinguish accurately between groups of right- and left(mixed)-dominant persons.

Additional Validity Data

In a separate study, 30 subjects (15 right-handed; 15 left-handed) having completed the LAI, returned to our laboratory two months after

original testing.[3] These subjects were asked to perform a series of 18 activities. These performances related to the 3 items loading heaviest on each of the 6 factors originally identified. Performances were scored 1 for right, 3 for both, and 5 for left responses. Pearson product-moment correlations were computed between original verbal report and actual manual performance. Table 4 presents the correlations between these two measures.

Insert Table 4 about here

Except for item 13, these correlations were all highly significant. Also, the overall correlation coefficient between verbal report and manual performance was .98, indicating that the LAI has an extremely high degree of predictive validity.

Discussion

The results of the present investigation reveal that the LAI is a reliable and consistently accurate means of assessing cerebral laterality. Furthermore, this instrument has been shown to separate right- and left-dominant groups with an extremely high degree of predictive accuracy. Also, this paper represents a major effort to characterize the underlying nature of the laterality dimension and factors which account for the separation of individuals along this continuum.

Data from several sources indicate that the LAI is a very consistent and reliable measure--a finding to be expected with an instrument of this sort. More important, perhaps, is the fact that the LAI has a great degree of content and predictive validity. It has been shown to predict

with complete accuracy, a person's position on the laterality continuum, which extends from "pure" right- to "pure" left-dominance. Also, the relationships between verbal report and subsequent manual performance were nearly perfect over a two-month delay interval, suggesting that the predictive efficiency of the LAI is substantial. The LAI also provides the investigator with the ability to select subgroups in completely flexible manner. Cut-offs may be determined by the researcher's needs for isolation of individuals falling in any segment of the laterality continuum.

The factor structure of the LAI appears stable, and has great intuitive appeal. The first general factor, which accounts for a large proportion of the total variance, lends support to the notion that the LAI acts as a pure laterality measure. The five additional factors relate to sets of both fine and gross motor movements which distinguish well between right- and left-sided groups. The groups of items which deal with rotational activities, hand coordinative activities, athletic arm-swinging movements, and clothing activities, all involve a degree of skill and considerable precision. Most of us are far more adept at these type of motions with one side of the body than the other. The factor dealing with carrying motions is probably somewhat confounded with strength.

Another source of empirical evidence which lends support to the overall validity of the LAI as a laterality discriminator, involves several experiments recently conducted in our laboratory. It has been frequently proposed that left-handed individuals should show a decrement in visuo-spatial processing abilities (Levy, 1969; Miller, 1971; Sherman, Kulhavy & Burns, 1976; Sherman, 1976). The source of this decrement

centers on the lateralization of cerebral function. In right-handers, the left hemisphere is usually specialized for verbal-relational processing, whereas visuo-spatial, wholistic abilities are confined to the right-hemisphere. In most left-handers, verbal abilities apparently develop in both hemispheres to some degree, at the expense of the spatial abilities. This pattern of results has been replicated several times by independent researchers. In a recent test of this hypothesis, we were able to account for up to 15% of the variance in recall of concrete visuo-spatial material using the three scores derived from the LAI, as predictors. Thus, the LAI can, evidently, distinguish between the various patterns of cortical organization which characterize right- and left-dominance.

Finally, perhaps the greatest advantage of the LAI is the rapid administration and ease of scoring which are associated with it. It can be administered to large groups as a screening device, and takes less than 2 min. to score by hand. Furthermore, the development of the LAI represents the first attempt in questionnaire research of this sort, to identify and describe the types of abilities which account for the separation between groups of right- and left-dominant individuals. Also, the extensive data base available with the LAI makes it an extremely useful investigative or diagnostic tool which can be used in conjunction with various programs of educational and psychological research.

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Footnotes

1. Some of these items were adapted from Crovitz and Zener (1962), Raczkowski, Kalat, and Nebes (1974), and Oldfield (1971).

2. The intercorrelation and transformation matrices are available from the authors upon request. Contact Jay L. Sherman, Laboratory for the Study of Human Intellectual Processes, 322 Payne Hall, Arizona State University, Tempe, Arizona 85281.

3. A description of these experiments may be obtained from the authors upon request.

Table 1

Means, Standard Deviations, and Discrimination Indices of the 45 Items Comprising the LAI, for Two Sample Sizes

Items	Sample size 1000			Sample size 310		
	X	SD	Disc.	X	SD	Disc.
1.	1.639	1.424	.861	2.981	1.956	.866
2.	1.632	1.426	.852	2.977	1.962	.858
3.	1.951	1.279	.700	2.626	1.594	.774
4.	1.757	1.262	.876	2.716	1.689	.896
5.	1.550	1.241	.814	2.448	1.809	.816
6.	1.629	1.280	.899	2.658	1.813	.916
7.	1.720	1.339	.869	2.826	1.819	.873
8.	1.713	1.214	.854	2.603	1.678	.862
9.	1.546	1.256	.806	2.448	1.842	.826
10.	1.518	1.115	.790	2.255	1.661	.777
11.	1.713	1.244	.848	2.623	1.711	.856
12.	2.038	1.150	.824	2.826	1.471	.848
13.	2.922	1.022	.198	3.065	1.053	.190
14.	2.280	1.009	.703	2.858	1.174	.734
15.	1.829	1.323	.865	2.958	1.739	.861
16.	1.854	1.217	.842	2.752	1.578	.867
17.	1.926	1.052	.716	2.558	1.332	.728
18.	2.088	1.029	.454	2.381	1.240	.455
19.	2.164	.910	.579	2.565	1.080	.551
20.	1.349	.805	.464	1.616	1.090	.442
21.	1.863	1.102	.725	2.474	1.407	.747
22.	2.427	1.078	.496	2.774	1.215	.534
23.	2.082	1.052	.658	2.600	1.280	.677
24.	1.842	1.171	.830	2.707	1.514	.846
25.	1.755	1.346	.858	2.842	1.834	.873
26.	1.614	1.229	.630	2.232	1.673	.655
27.	2.197	1.010	.673	2.694	1.215	.697
28.	1.516	1.117	.628	2.055	1.607	.617
29.	1.969	1.019	.570	2.384	1.240	.590
30.	1.986	1.047	.634	2.442	1.298	.666
31.	1.944	1.429	.630	2.668	1.692	.738
32.	1.785	1.326	.803	2.736	1.737	.831
33.	1.899	1.281	.745	2.690	1.627	.760
34.	1.730	1.295	.792	2.626	1.726	.812
35.	1.839	1.367	.761	2.758	1.736	.807
36.	1.939	1.202	.760	2.626	1.538	.806
37.	1.804	1.304	.821	2.774	1.739	.824
38.	1.651	1.757	.114	1.707	1.803	.115
39.	2.340	1.397	.217	2.455	1.449	.261

Table 1

(continued)

40.	1.652	1.096	.793	2.239	1.523	.777
41.	2.034	1.108	.625	2.474	1.333	.718
42.	1.587	1.258	.423	1.932	1.574	.437
43.	1.667	1.116	.668	2.242	1.534	.674
44.	2.448	1.272	.246	2.645	1.340	.243
45.	2.222	1.102	.365	2.477	1.201	.365

Table 2

Rotated Factor Matrix

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
6.	.75365	.31116	.34318	.27136	.08202	.07952
7.	.83672	.28161	.28038	.11304	.11211	.07655
8.	.68707	.38766	.29078	.24490	.11072	.11625
10.	.64090	.31731	.34139	.19689	.05487	.11382
15.	.77554	.35920	.28075	.07930	.05576	.09228
16.	.64173	.47005	.27396	.12813	.10410	.10480
17.	.80660	.53408	.28555	-.00293	.08713	.08572
23.	.81443	.55125	.18850	.22153	09754	.08295
24.	.64978	.36607	.29969	.21918	.12285	.10720
25.	.76435	.30479	.29866	.13912	.10371	.08099
26.	.42766	.29377	.27177	.35799	-.08215	.12363
27.	.39972	.57804	.15882	-.01929	.06756	.19450
40.	.47612	.50713	.22496	.27085	.17305	-.04997
41.	.32283	.55074	.12082	.18809	.32884	-.03482
43.	.42768	.45493	.24116	.29621	.15370	-.02676
45.	.04309	.40917	.07293	.13990	.22157	.04804
1.	.88669	.20157	.25904	.14963	.06836	.07153
2.	.88385	.16925	.26698	.13486	.05804	.07691
3.	.40616	.50392	.22143	.10670	.14789	-.07654
4.	.68578	.41851	.36406	.19922	.09939	.08454
11.	.65167	.46660	.34198	.12059	.13528	.06219
12.	.65349	.47874	.26663	-.02353	.14120	.08897
14.	.46365	.54622	.18464	-.08695	.12915	.18319
18.	.10626	.52146	.14955	.00346	.06863	.06584
19.	.21529	.71076	.12354	.00256	.12311	.11538
20.	.22785	.41766	.32456	.17594	-.01457	.00166
21.	.33921	.64520	.31486	.14222	-.01395	-.01799
29.	.28075	.62948	.19185	.19704	.06287	.12020
30.	.34642	.63915	.15225	.16685	.12506	.14596
31.	.31303	.20187	.64343	.08451	.00952	.04915
32.	.52738	.17997	.67194	.20839	.05926	.03205
33.	.37733	.36809	.61156	.16461	.07687	-.03935
34.	.45457	.22787	.73829	.14009	.06711	.01971
35.	.52095	.20908	.58405	-.01165	.01389	.03984
36.	.40761	.36304	.60049	.07994	.00376	.05240
37.	.60585	.26867	.54611	.09427	.02955	.06538
5.	.59330	.33203	.24525	.54561	.01708	-.01841
9.	.67288	.29744	.23498	.42912	.01839	.07037
28.	.47016	.51027	.29241	.35361	.07061	.08119

Table 2

(Continued)

38.	.03804	-.00868	.00575	.22976	.13887	-.00018
42.	.19935	.22726	.15793	.39125	.01803	.06157
39.	.02728	.14439	.04758	.11486	.52537	.13069
44.	.11172	.22842	-.02683	.02801	.47646	.15386
13.	.09311	.08140	.01444	-.01155	.18126	.59540
22.	.18132	.38805	.05918	.10382	.19666	.48308

Table 3

Standardized Discriminant Function

Coefficients for the 45 Items Comprising the LAI (n = 1001)

Item	Coefficient	Item	Coefficient	Item	Coefficient
1.	-.16269	16.	-.00687	31.	.00093
2.	-.13592	17.	-.00384	32.	.00481
3.	.00218	18.	-.00509	33.	-.00189
4.	-.00139	19.	-.00294	34.	-.00240
5.	.00032	20.	-.00191	35.	.00492
6.	-.01358	21.	.00320	36.	.00232
7.	.00046	22.	.00128	37.	-.00478
8.	.00027	23.	-.00432	38.	-.00065
9.	-.00385	24.	-.00099	39.	-.00123
10.	-.00012	25.	.00004	40.	-.00013
11.	00023	26.	.00074	41.	.00045
12.	.00883	27.	.00668	42.	-.00164
13.	.00061	28.	.00090	43.	.00059
14.	.00314	29.	.00186	44.	-.00025
15.	.00098	30.	.00301	45.	-.00009

Table 4

Correlations Between Original Verbal Report and Performance for 18 Selected Items (n = 30)

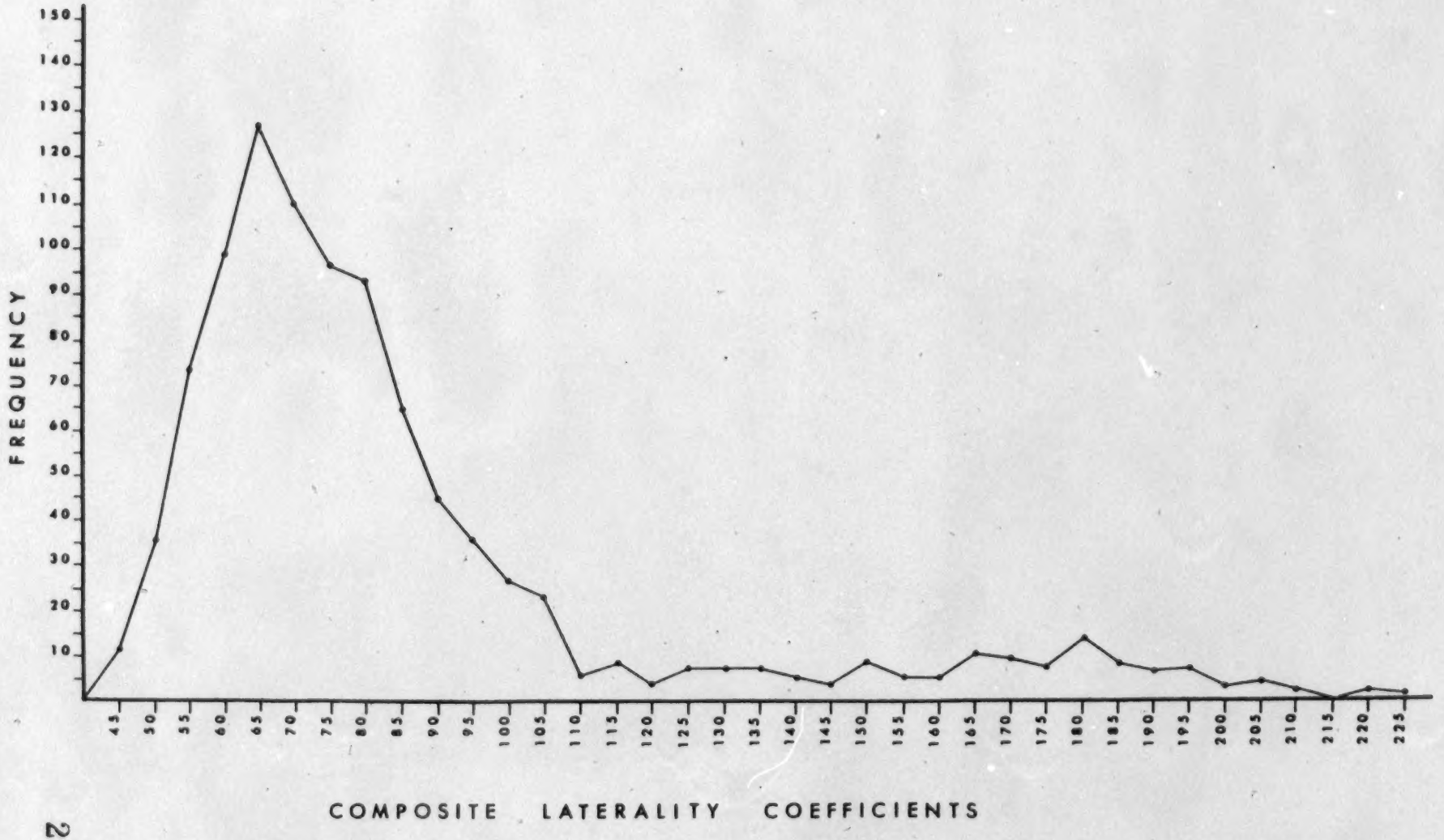
Item	Correlation	Probability
1.	1.00	.001
2.	1.00	.001
3.	.69	.001
5.	.99	.001
7.	.92	.001
9.	.98	.001
13.	.62	.001
19.	.61	.001
21.	.67	.001
22.	.78	.001
27.	.91	.001
31.	.98	.001
32.	.94	.001
34.	.99	.001
39.	.30	.070
41.	.50	.006
42.	.98	.001
44.	.64	.001

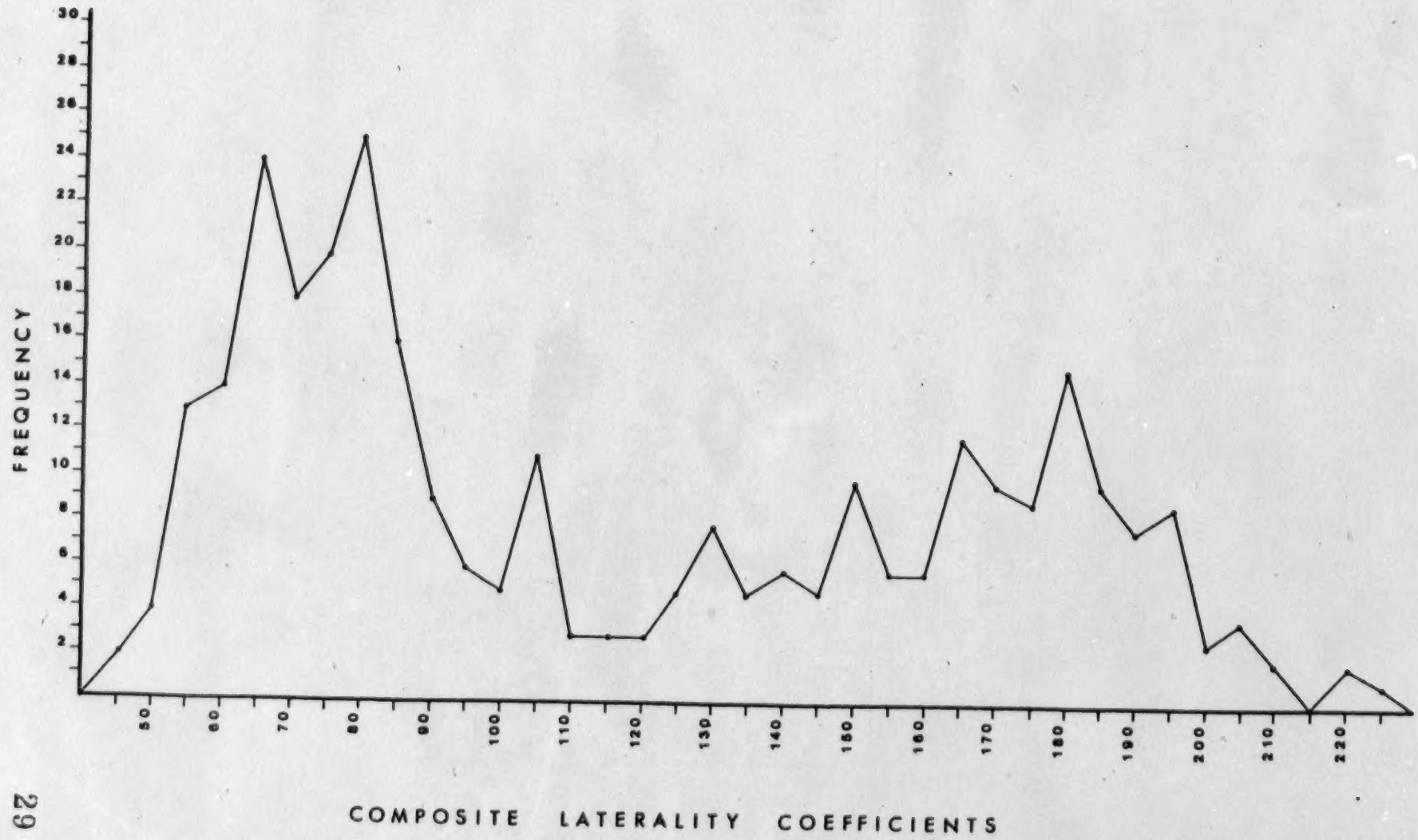
Figure Captions

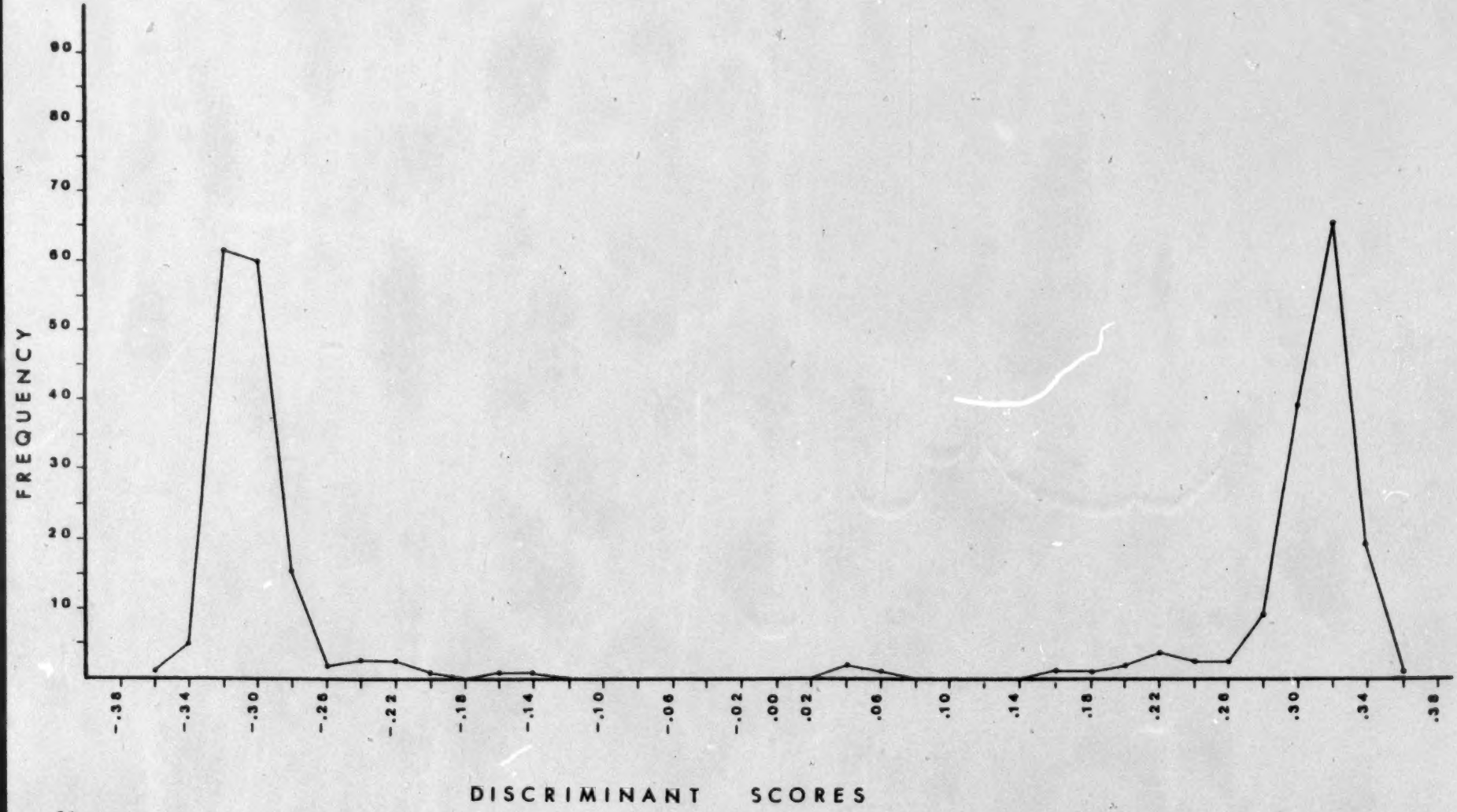
Figure 1. The distribution of composite laterality coefficients, for 1000 cases.

Figure 2. The distribution of composite laterality coefficients, for 155 right- and 155 left(mixed)-dominant persons.

Figure 3. The distribution of discriminant scores for 155 right- and 155 left(mixed)-dominant persons.


FREQUENCY
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225
COMPOSITE LATERALITY COEFFICIENTS


FREQUENCY
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
COMPOSITE LATERALITY COEFFICIENTS


FREQUENCY
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80
70
60
50
40
30
20
10
-.38
-.34
-.30
-.26
-.22
-.18
-.14
-.10
-.06
-.02
.00
.02
.06
.10
.14
.18
.22
.26
.30
.34
.38
DISCRIMINANT SCORES

Appendix A

The 45 items comprising the Sherman-Kulhavy

Laterality Assessment Inventory

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With which hand do you:

1. draw
2. write
3. remove the top card of a deck of cards
4. use a bottle opener
5. throw a baseball
6. use a hammer
7. use a toothbrush
8. use a screwdriver
9. use a tennis racket
10. use scissors
11. hold a match when striking it
12. stir a liquid or semi-solid
13. carry your books or bookbag
14. pick up the salt or pepper shaker
15. use an eraser on paper
16. pour a large volume of liquid from a pitcher
17. tear paper from a tablet
18. turn pages of a book
19. turn a door knob
20. wind a watch

21. screw a jar top
22. prefer to carry a suitcase
23. remove an object from a high shelf
24. comb your hair
25. hold a spoon
26. hold a knife when cutting food
27. hold a filled cup or glass when drinking
28. turn a toy top
29. adjust a window blind
30. put a plug into a powerpoint
31. hold an apple while you are peeling it
32. hold a nail when hammering
33. hold bottle when removing top
34. hold a potato when peeling it
35. hold needle when threading
36. hold dish when wiping
37. when buttering bread, which hand holds the bread
38. when holding a golf club, which is the lower hand
39. which arm do you place in a sleeve first
40. if both hands were free, which hand would you use to put the key into a keyhole
41. when feeling material to determine the texture or thickness, which hand would you use
42. on which shoulder do you rest a bat before swinging
43. which foot do you use to kick a ball
44. which foot do you put a shoe on first
45. which hand do you cover your mouth with when you sneeze